

A Path Through the Records – The Ancient Lunar Dome

Part 4 of 5

2026-06-04 Dr. Graeme Innes

The author acknowledges the inspiration of The Other Side of Midnight podcasts with Richard C. Hoagland and the website <https://www.enterprisemission.org>.

In Part 3 of this article, the dome was viewed in the near-visible portions of the electromagnetic spectrum (infra-red and ultraviolet) and with radar. In Part 4, the dome is viewed in the extreme-ultraviolet and x-ray end of the spectrum, at a position in space away from the earth-moon system.

EUV and X-ray Data

Extreme-ultraviolet (EUV) and soft x-rays interacting with the ancient lunar dome produce extraordinary effects, as seen in a STEREO B photo of the moon silhouetted against the sun, Figs 1 and 2. These two spectral ranges will be considered together since the data for both were obtained by the same instrument.

The usual bright ring around the lunar disc appears in these wavelengths. The STEREO platform was in solar orbit, well away from earth, yet the same bright ring was evident at that vantage point. Since part of the lunar far side (as seen from earth) was within the STEREO view, it implies the entire moon must be covered by the dome ruins.

Perhaps the most important fact is that the center of the lunar disc was emitting soft x-rays with a comparable intensity to that from the background sun. This cannot be explained by reflections from the distant earth.

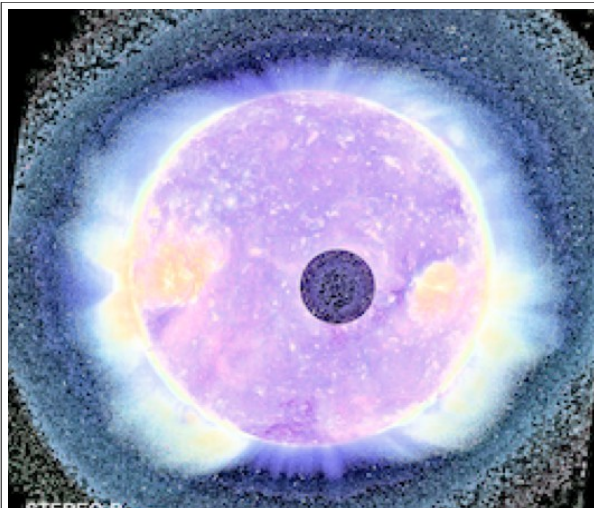
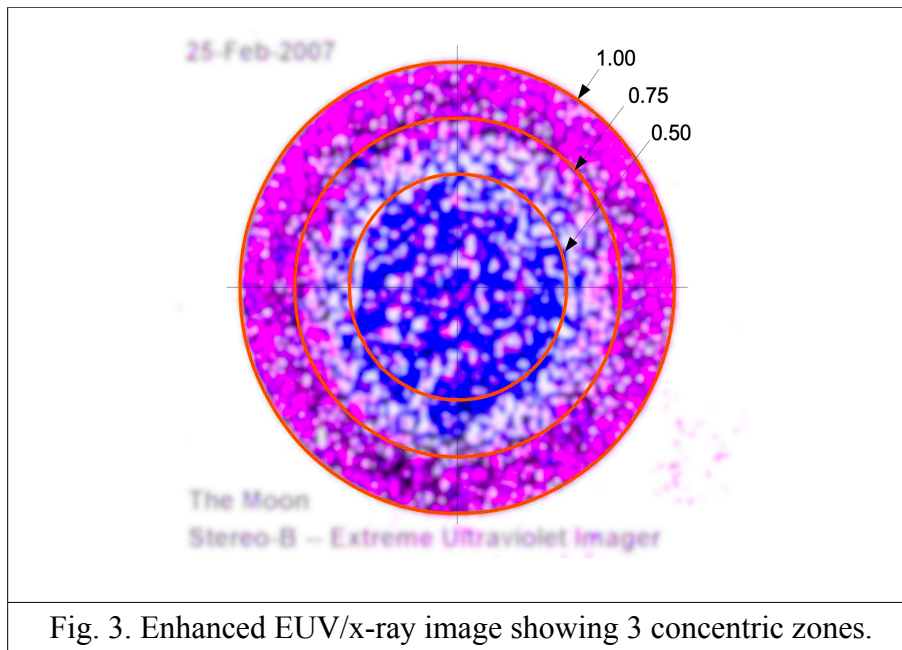


Fig. 1 Wide angle STEREO view of the sun aligned with the moon, 25 February 2007.



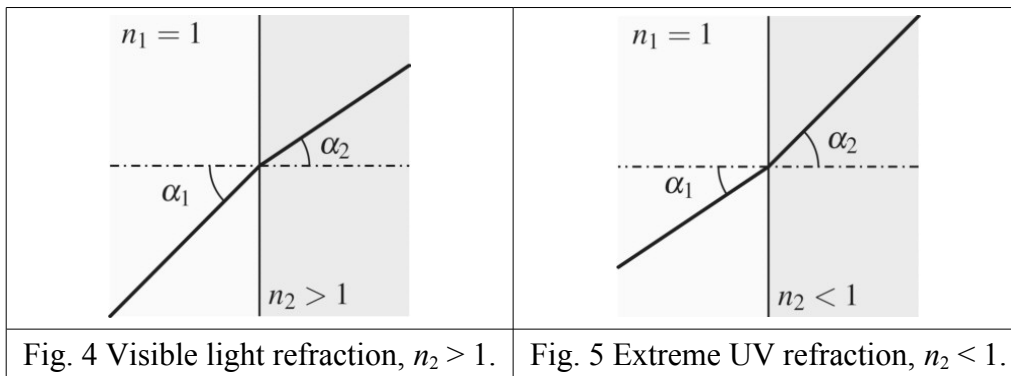
Fig. 2 Closeup of the moon seen against the solar disc.



X-ray Analysis

It is important to understand the physics involved in producing the photograph of Fig. 2. When this image of the moon is enhanced, Fig. 3, there appear to be three concentric zones of differing wavelengths (colours), indicated by reference circles of lunar radius $r = 1, 0.75$ and 0.5 .

The STEREO EUV camera was designed to see in 4 narrow bands with wavelengths 17.1, 19.5, 28.4, and 30.4 nm (<https://www.eoportal.org/satellite-missions/stereo#references> Bandpass specifications). At such “soft x-ray” wavelengths, an inverse angle-of-refraction effect occurs when the light enters a transparent material. While visible light bends towards the surface normal, Fig. 4, x-rays and EUV light refract away from the normal, Fig. 5 (<https://x-ray-optics.de/index.php/en/physics/refraction>).



Thus, the index of refraction n_2 appears to be less than unity, which is confirmed by published data for materials such as diamond at EUV wavelengths, Fig. 6 (<https://refractiveindex.info/?shelf=3d&book=crystals&page=diamond>).

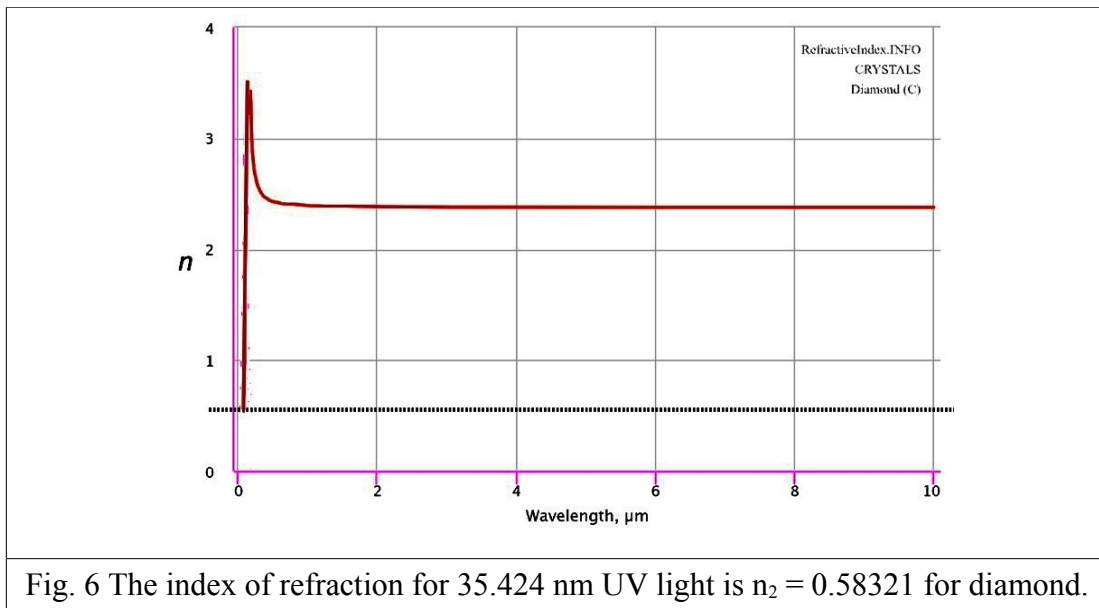


Fig. 6 The index of refraction for 35.424 nm UV light is $n_2 = 0.58321$ for diamond.

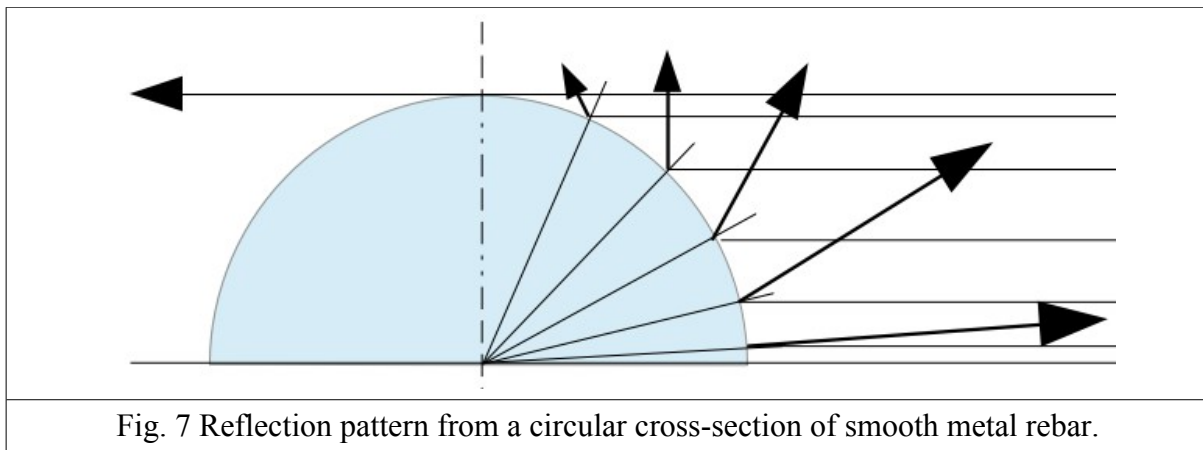
The enhanced lunar image of Fig. 3 is essentially composed of two colours (17.1 and 30.4 nm), which differentiate two effects:

The longer wavelength zone (red for 30.4 nm) extends from the $r \approx 0.5$ circle to the lunar rim $r = 1$. This zone seems to be dominated by refraction of UV through the fragments of dome glass. At $r \approx 0.5$, the Brewster's angle is $\theta_B \approx 60^\circ$, corresponding to a glancing (reflecting) angle of 30 degrees. From Brewster's formula $n_2 = 1/\tan\theta_B$, the index of refraction is less than unity, $n_2 \approx 0.58$, which is consistent with the known behaviour of EUV wavelengths. The red zone disappears for $r < 0.5$ since reflection replaces refraction at incident angles greater than the Brewster's angle.

The shorter wavelength zone (blue for 17.1 nm) extends from $r \approx 0.75$ to the center of the lunar disc. The 17.1 nm EUV behaves in a manner very similar to x-rays, which tend to penetrate non-metallic materials and can only reflect at grazing angles to such surfaces. Reflection of x-rays can still occur from denser metallic materials. Therefore, this zone seems to be dominated by reflection from both glass and metallic surfaces within the dome, particularly from titanium cables or rebar used to suspend glass panels, Part 3 of this article series.

Scattering occurs in a distinct pattern for a smooth round cable or rebar cross-section, favouring reflections back towards the illuminating source, Fig. 7. The countless pieces of material within the dome evidently constitute a matrix that distributes x-rays, even to the center of the lunar disc.

Since the red and blue zones overlap between $0.5 < r < 0.75$, that central zone appears brighter. Similarly, the dome concentrates EUV and x-ray energy from the sunward side of the moon at the rim, where the two colours add to form the thin bright ring around the lunar disc.



In Part 5, Artemis II photographs from the far side of the moon show the dome under polarized zodiacal lighting. Advice about avoiding the dome ruins is also given for missions planning to land on the lunar surface.

Homework Assignment

Experiment #4:

- Find and study a few dental or other medical x-rays.
- Medical x-rays are stopped from passing through dense biological tissue, especially bone or teeth.
- The STEREO imager senses the softest of x-rays, which have the least penetrating power.
- How can medical x-rays be stopped by a few centimeters of material, but a 2160 mile (3475 km) thick moon seem to allow solar x-rays to pass through it?